Int. J. Electrochem. Sci., 13 **(2018)** 45 – 57

International Journal of
ELECTROCHEMICAL
SCIENCE
www.electrochemsci.org

Electrical and Thermal Properties of Poly(methylmetacrylate) Composites Filled With Electrolytic Copper Powder

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doi: 10.20964/2018.01.24

Received: 5 September 2017 / *Accepted:* 26 October 2017 / *Online Published:* 1 December 2017

The results of experimental studies of the properties of composite materials based on poly(methylmetacrylate) (PMMA) matrices filled with electrolytic copper powder, having very high dendritic structure, are presented in this manuscript. Copper powder volume fractions used as filler in all prepared composites were varied in the range of 0.5 - 8.8 %(v/v). The samples were prepared by hot molding injection at 180°C. Influence of particle size and morphology on the conductivity and percolation threshold and thermal properties of the composites were examined and characterization included: Scanning Electron Microscopy (SEM), Energy-dispersive X-ray spectroscopy (EDS), Thermogravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC), Atomic Forces Microscopy (AFM). Composites have shown improvement of thermal characteristics in relation to pure polymer. Presence of three dimensional conductive pathways was confirmed. The obtained percolation threshold of 2.89 %(v/v) is about three times lower than the one stated in the literature, which is ascribed to different morphology of filler used in investigation.

Keywords: electrical conductivity, thermal stability, composite materials, lignocellulose, PMMA

FULL TEXT